6 OPERATING THE BIOMEK® 2000 AUTOMATION WORKSTATION

6.1 INTRODUCTION

6.1.1 Training on the operation of the BioMek® 2000 Automation Workstation will be divided into two sections. Section I covers the training requirement for a new Project Coordinator. Section II covers the training of the non-Project Coordinator DNA trainee and casework examiner.

6.2 GOAL – SECTION I

6.2.1 To be familiar with how to initiate the BioWorks™ program.

6.2.2 To understand how to set up the deck for isolation of DNA.

6.2.3 To be able to make modifications to the BioWorks™ program.

6.2.4 To be familiar with the BioMek® 2000 Automation Workstation and associated programs to troubleshoot problems.

6.2.5 To assist the examiners by becoming the Project Coordinator of the BioMek® 2000 Automation Workstation and providing oversight to the Forensic Laboratory Specialist who will serve as the primary operator.

6.3 TASKS – SECTION I

6.3.1 Read and become familiar with the Commonwealth of Virginia Department of Forensic Science Forensic Biology Section Procedure Manual, Section IV - BioMek® 2000 Automation Workstation Procedure Manual.

6.3.2 Learn about each step of the BioWorks™ program and the operation of the BioMek® 2000 Automation Workstation, including required documentation.

6.3.3 Observe the Forensic Molecular Biologist and/or Qualified Project Coordinator isolate DNA from a plate of casework samples. Observe the entire DNA isolation process, deck setup, and program design.

6.3.4 Run a set of samples consisting of at least 56 water blanks containing Bromophenol Blue dye. Perform the DNA isolation, set up the deck, and run the program under the direct supervision of the Forensic Molecular Biologist and/or Qualified Project Coordinator.

6.3.5 Initiate the BioMek® 2000 Workstation calibration programs and perform the position calibration test, the base module and left side module alignments, and shaker and thermal exchange unit alignments. The procedure for performing these calibrations is outlined in Commonwealth of Virginia Department of Forensic Science Forensic Biology Section Procedure Manual, Section IV- BioMek® Automation Workstation Procedure Manual.

6.3.6 Run a checkerboard and a zebra stripe training set.

6.3.6.1 Checkerboard: One set of samples consisting of 48 samples (24 blood and/or buccal samples and 24 blanks). The samples will be isolated and run on the BioMek® 2000

Workstation following the procedure outline in the Commonwealth of Virginia Department of Forensic Science Forensic Biology Section Manual, Section IV - BioMek® Automation Workstation Procedure Manual. These samples will not be taken any further unless contamination is detected in other training samples carried through the isolation, quantitation, dilution and amplification set up steps.

6.3.6.2 Zebra Stripe: One set of samples consisting of 48 samples (24 blood and/or buccal samples and 24 blanks). The samples will be isolated and run on the BioMek® 2000 Workstation following the procedure outlined in the Commonwealth of Virginia Department of Forensic Science Forensic Biology Section Procedure Manual, Section IV - BioMek® Automation Workstation Procedure Manual. These samples will not be taken any further unless contamination is detected in other training samples carried through the isolation, quantitation, dilution and amplification set up steps.

6.3.7 The trainee will conduct a minor quantitation study using the BioMek® 2000 Automation Workstation and the AluQuant® Human Quantitation System.

6.3.7.1 Two sets of samples will be prepared. Each set will contain quadruplicate DNA samples at a concentration of 4, 2, 1, 0.5, 0.25, 0.125, 0.062, and 0.031 ng/µL of DNA.

6.3.7.2 The concentration of each sample will be determined using the AluQuant® Calculator. The empirically determined DNA concentration for all 4 ng/µL samples should fall within ± 2.0 ng/µL of the known concentration of DNA. All other samples should fall within ± 1.0 ng/µL of the known concentration of DNA.

6.3.8 Perform the adjustment of the data points on the standard curve for the five sets of problem data in order to improve the quality of the AluQuant® DNA Standard Curve used to estimate the concentration of the sample DNA.

6.3.9 Observe the Forensic Molecular Biologist and/or Qualified Project Coordinator dilute and set up samples for amplification using the Normalization Wizard and PCR Amplification Set Up programs on a set of at least 16 casework samples.

6.3.10 Using the Normalization Wizard and PCR Amplification Set Up programs, set up two sets of samples consisting of at least 16 water blanks. Each set should be set up independent of the other. Run the program under the direct supervision of the Forensic Molecular Biologist and/or Qualified Project Coordinator.

6.3.11 The trainee will conduct a minor validation.

Checkerboard: One set of samples consisting of at least 32 samples (16 blood and/or buccal samples and 16 blanks) will be taken through the Normalization Wizard and Amplification Set Up steps. Two sets of samples consisting of 40 samples (20 blood and/or buccal samples and 20 blanks) will taken through the DNA isolation, quantitation, and amplification steps using the BioMek® 2000 Automation Workstation in conjunction with the AluQuant® Human Quantitation System, Normalization Wizard, and PCR Amplification Set Up programs. The procedures outlined in the Commonwealth of Virginia Department of Forensic Science Forensic Biology Section Procedure Manual, Section IV - BioMek® Automation Workstation

Procedure Manual will be used. These samples will be carried through the product gel and typing steps. NOTE: each set of samples will be run independently of the other sets.

6.3.12 Perform DNA isolation, quantitation, and amplification using the BioMek® 2000 Automation Workstation in conjunction with the DNA IQ™ Extraction, AluQuant® Human Quantitation System, Normalization Wizard, and PCR Amplification Set Up programs on two sets of competency samples assigned. The samples will be loaded as they would be if they were actual casework samples. The first set will included at least 10 samples that are typically encountered in casework analysis, such as blood samples, buccal swabs, cigarette butts, etc. The second set of samples will include at least 12 mixture samples requiring a differential extraction. All samples will be carried through the product gel and typing steps.

6.4 TRAINING EVALUATION – SECTION I

6.4.1 Evaluation of documentation skills by the Forensic Molecular Biologist and/or Qualified Project Coordinator.

6.4.2 The trainee should understand and be able to independently operate the BioMek® 2000 Automation Workstation. This will be evaluated and monitored throughout the training.

6.4.3 Completion of the checklist by the Forensic Molecular Biologist and/or Qualified Project Coordinator.

STUDY QUESTIONS:

1. How far in advance can the BioMek® 2000 Automation Workstation setup be performed before the 96 deep well plate containing samples is loaded onto the deck of the robot?

2. What is the purpose for conducting the position calibration? The base module alignment? The left side module alignment? The shaker-thermal exchange unit alignment? How often is each quality control measure preformed?

3. In the case of an emergency, what is the best way to shut the BioMek® 2000 Automation Workstation down?

4. Why is it imperative to ensure that no air bubbles exist in the sample during the AluQuant® Human Quantitation procedure and Normalization Wizard and amplification setup steps?

CHECKLIST FOR OPERATING THE BIOMEK® 2000 AUTOMATION WORKSTATION – SECTION I

Name of Trainee (Project Coordinator): _____

1. The trainee can independently operate the BioMek® 2000 Automation Workstation, including conducting DNA isolation, deck setup, and program design, and accurately complete the appropriate documentation.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

2. The trainee can independently perform the BioMek® 2000 Automation Workstation calibration programs, the position calibration test, the base module and left side module alignments, and shaker and thermal exchange unit alignments and can accurately document the results.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

3. The trainee has successfully run the Checkerboard and Zebra Stripe training sets using the BioMek® 2000 Automation Workstation.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

4. The trainee has successfully performed quantitation studies using the BioMek® 2000 Automation Workstation and the AluQuant® Human Quantitation System.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

5. The trainee has successfully performed Checkerboard contamination studies using the BioMek® 2000 Automation Workstation in conjunction with the Normalization Wizard and PCR Amplification Set Up programs.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

6. The trainee has successfully performed the adjustment of data points on the AluQuant® DNA Standard Curve for five sets of data.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

7. The trainee has successfully completed the analysis of the two sets competency samples.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

8. The trainee has gained the knowledge and skills necessary to operate the BioMek® 2000 Automation Workstation and recognize when a problem arises, and when appropriate, to manually shut down the system, troubleshoot the problem and/or seek assistance.

   Date:_____ Forensic Molecular Biologist and/or Qualified Project Coordinator:_____

   Comments:_____

Qualified By:_____ Date:_____

Forensic Molecular Biologist
and/or Qualified Project Coordinator

6.5 GOALS – SECTION II

6.5.1 To be familiar with how to set up the samples for isolation on the BioMek® 2000 Automation Workstation, including the required documentation.

6.5.2 To understand the purpose of the plate blanks and where they are located.

6.6 TASKS – SECTION II

6.6.1 Read and become familiar with the Commonwealth of Virginia Department of Forensic Science Forensic Biology Section Procedure Manual, Section IV - BioMek® 2000 Automation Workstation Procedure Manual.

6.6.2 At a minimum isolated DNA from the 7 blood stains and 5 mixed biological stains addressed in Section 4, DNA Isolation, plus controls. Note: In accordance with the instruction provided in Section 4 of this manual, the blood stain set and mixed biological stain set will be isolated on the BioMek® 2000 Automation Workstation at different times.

6.6.3 Observe the Project Coordinator run the blood stains and mixed biological stains through the entire DNA isolation process, deck setup, and initiation of the BioWorks™ program.

6.6.4 Continue on to Chapter 7, DNA QUANTITATION – ALUQUANT® HUMAN QUANTITATION METHODS.

STUDY QUESTIONS:

1. Please explain the 96 deep well plate setup when more than one DNA examiner's evidence samples are isolated using the BioMek® 2000 Automation Workstation.

2. How does the 96 deep well setup differ when evidence and known samples are isolated at the same time using the BioMek® 2000 Automation Workstation?

3. How does the 96 deep well setup differ once the known samples have been loaded into the deep well plate and subsequently a different examiner wants to load evidence samples into the deep well plate?

4. What is the purpose of the plate blanks?

5. If a signal is detected in a plate blank, how does this affect the rest of the samples isolated during that particular run?

CHECKLIST FOR OPERATING THE BIOMEK® 2000 AUTOMATION WORKSTATION – SECTION II

Name of Trainee: _____

1. Trainee has isolated the DNA from the following samples using the BioMek® 2000 Automation Workstation:

   - A minimum of 7 blood stains
   - A minimum of 5 mixed biological stains (at total of 10 samples), to include semen, vaginal fluid, blood, and saliva.

   Date:_____ Project Coordinator:_____

   Comments:_____

2. Trainee has observe the Project Coordinator run the blood stains and mixed biological stains through the entire DNA isolation process, deck setup, and initiation of the BioWorks™ program

   Date:_____ Project Coordinator:_____

   Comments:_____

♦END